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(81) Designated States: AT (European patent), BE (European patent), BR, CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).

Published
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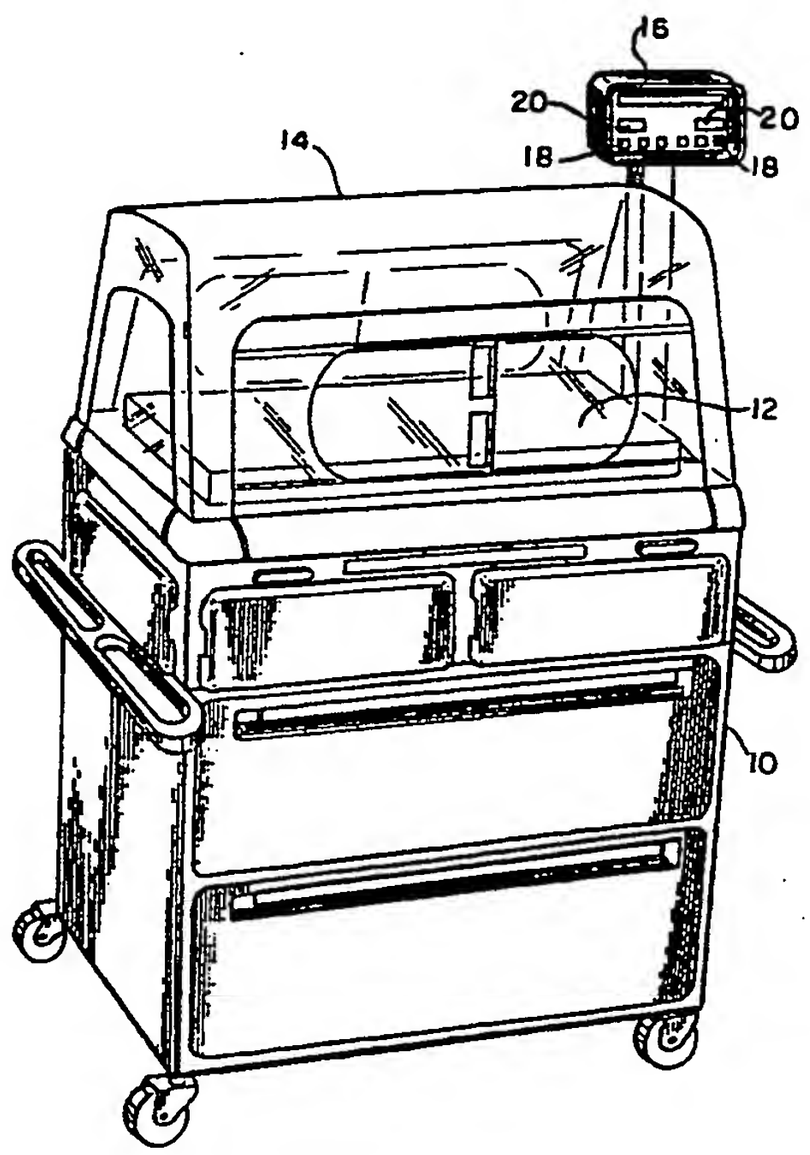
With amended claims and statement.

(54) Title: INCUBATOR WITH REMOTE CONTROL AND DISPLAY MODULE



(57) Abstract

An infant incubator in which the controls and displays are provided in a module which is in proximity to but spaced from and above the hood of the incubator at generally the eye-level of a standing adult.

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INCUBATOR WITH REMOTE CONTROL AND DISPLAY MODULE

Technical Field

The present invention relates, in general, to infant incubators and, in particular, to an infant incubator having a control and display module positioned for easier access and better viewing than provided by currently known incubators.

Background Art

An incubator is a medical unit which provides a controlled environment for a premature or otherwise

delicate or sick infant. The incubator isolates the infant from the outside atmosphere which might be the source of infections or which might be inadequate to aid the infant in overcoming his difficulty.

Infant incubators generally are provided with control means for adjusting the environment within the incubator (i.e., the temperature, humidity, and oxygen content of the atmosphere within the incubator) and display means for indicating the conditions of the environment within the incubator and the condition of an infant positioned within the incubator (i.e., respiration rate and skin temperature). All known incubators have the controls and displays mounted on the front of the base of the incubator and below the hood. This location of the controls and displays is inconvenient to those attending to the care of an infant within the incubator. One must bend down to read the displays and, when the front door of the incubator is open to provide complete access to an infant, one must work around the open front door. In addition, in order to observe the displays which indicate the conditions within the incubator and the condition of the infant, one must be right at the incubator and cannot observe these displays from a remote location.

Disclosure of Invention

An incubator, constructed in accordance with the present invention, includes a base having an infant support and a hood mounted on the base and adapted to enclose the infant support. Also included are air conditioning means for developing conditioned air within the base and below the infant support and for circulating the conditioned air from below the infant support into the hood and returning air from the hood to below the infant support. This incubator further includes first sensing means for developing signals representative of the conditions of the environment within the hood and second sensing means for developing signals representative of the condition of an infant positioned within the hood. A control and display module is provided for (1) controlling the environment within the hood and (2) displaying the conditions of the environment within the hood and the condition of an infant within the hood. The control and display module is mounted at a position in proximity to but spaced from and above the hood at generally the eye-level of a standing adult. Also included are means for transmitting and receiving signals between the control and display module and: (1) the air conditioning means to control the environment within the hood, and (2) the first and the second sensing means to display the conditions of the environment within the hood and the condition of an infant positioned within the hood.

Brief Description of the Drawing

Referring to the drawing:

Figure 1 is a front, perspective view of an infant incubator constructed in accordance with the present invention; and

Figure 2 is a rear perspective view showing the manner in which the control and display module of the incubator is mounted on the base of the incubator.

Best Mode of Carrying Out the Invention

U.S. Patent No. 3,335,713 is incorporated herein by reference to supplement the disclosure of various components of an incubator, the details of which do not form a part of the present invention.

Referring to the drawing, an incubator, constructed in accordance with the present invention, includes a base 10 having an infant support 12 and a hood 14 mounted on base 10 and adapted to enclose infant support 12. Also included in the incubator are air conditioning means for developing conditioned air within base 10 and below infant support 12 and for circulating the conditioned air from below the infant

support into hood 14 and returning air from the hood to below the infant support. For additional details on an infant support which can be used and the apparatus for developing and circulating conditioned air, reference is made to U.S. Patent No. 3,335,713.

An incubator, constructed in accordance with the present invention, also includes first sensing means for developing signals representative of the conditions of the environment within hood 14 and second sensing means for developing signals representative of the condition of an infant positioned within the hood. The first sensing means can include, for example, a thermometer positioned at an appropriate location within hood 14 for developing a signal representative of the temperature within the hood. The second sensing means can include, for example, a skin temperature probe attached to the infant for developing a signal representative of the temperature of the infant. For additional details on the various sensors which can be used to monitor the incubator conditions and the condition of the infant, reference is made to U.S. Patent No. 3,335,713.

An incubator, constructed in accordance with the present invention, further includes a control and display module 16 for controlling the environment with hood 14 and displaying the conditions of the environment within the hood and the condition of an infant

within the hood. Control and display module 16 has a plurality of controls 18 which can control, for example, the temperature, humidity, oxygen content and circulation rate of the conditioned air which is introduced into hood 14. Control and display module 16 also has a plurality of displays 20 which can display the various parameters of the hood environment and the physical condition of the infant. The circuitry for effecting the desired controls and developing the desired displays can be of conventional construction and operation.

Control and display module 16 is positioned in proximity to but spaced from and above hood 14 at generally the eye-level of a standing adult. The positioning of control and display module 16 is such that it is clear of movement of hood 14 as the hood is pivoted to an open position about an axis extending along the rear side of base 10.

As shown most clearly in Figure 2, control and display module 16 is mounted by means of a vertically disposed post 22 which is attached at its lower end to base 10 and has the control and display module attached to its upper end. In the preferred embodiment of the invention, control and display module 16 is mounted for pivotal movement about a vertical axis. As a result, the control and display module can be positioned to suit the needs of those attending the infant

in the incubator as they treat the infant or monitor the infant and the incubator conditions from a remote location.

Control and display module 16 is attached to post 22 by means of a support arm 24 which is attached to the post, a bracket 26 to which the control and display module is attached, and a sleeve 28 which extends through vertically aligned openings in the support arm and the bracket and defines the vertical axis about which the control and display module pivots.

A locking mechanism is provided to fix the position of control and display module 16. For the embodiment of the invention illustrated, this locking mechanism includes a release latch 30 attached to bracket 26 for pivotal movement toward and away from support arm 24. Release latch 30 carries a pin 32 which is movable into and out from a series of openings 34 in support arm 24 as the release latch is moved toward and away from the support arm. A leaf spring 36, attached to bracket 26 and bearing against release latch 30, urges the release latch toward support arm 24, so that pin 32, carried by the release latch, will enter one of the openings 34 and lock control and display module 16 in place. To move the control and display module, release latch 30 is moved away from support arm 24 against the action of leaf spring 36 to retract pin 32 from opening 34. While pin 32 is clear

of any opening 34, control and display module 16 can be moved to the desired position and when release latch 30 is released, pin 32 can enter an opening 34 at the new position of the control and display module.

Also included in an incubator, constructed in accordance with the present invention, are means for transmitting and receiving signals between control and display module 16 and the air conditioning means and the first and second sensing means. Such means include wires 38 which extend between a connector 40 in base 10 and control and display module 16. The sensors in hood 14 and on the infant and the air conditioning means are electrically connected to connector 40 in the usual manner. In this way, controls 18 on the control and display module control the operation of the air conditioning means to control the environment within hood 14 and displays 20 on the control and display module display the conditions of the environment within the hood and the condition of an infant positioned within the hood. For the embodiment of the invention illustrated, post 22 is hollow and wires 38 extend from base 10 through the post. Wires 38 exit post 22 and extend beneath support arm 24 and up through sleeve 28 to control and display module 16.

While in the foregoing there has been described a preferred embodiment of the invention, it should be understood to those skilled in the art that

various modifications and changes can be made without departing from the true spirit and scope of this invention.

IN THE CLAIMS:

1. An incubator comprising:

a base having an infant support;

a hood mounted on said base and adapted to enclose said infant support;

air conditioning means for developing conditioned air within said base and below said infant support and for circulating conditioned air from below said infant support into said hood and returning air from said hood to below said infant support;

first sensing means for developing signals representative of the conditions of the environment within said hood;

second sensing means for developing signals representative of the condition of an infant positioned within said hood;

a control and display module for:
(1) controlling the environment within said hood, and
(2) displaying the conditions of the environment within said hood and the condition of an infant positioned within said hood;

mounting means for positioning said control and display module in proximity to but spaced from and above said hood at generally the eye-level of a standing adult;

and means for transmitting and receiving signals between said control and display module and: (1) said air conditioning means to control the environment within said hood, and (2) said first and said second sensing means to display the conditions of the environment within said hood and the condition of an infant positioned within said hood.

2. An incubator according to claim 1 wherein said mounting means include:

(a) a vertically disposed post,

(b) means for attaching the lower end of said post to said base, and

(c) means at the upper end of said post for attaching said control and display module to said post.

3. An incubator according to claim 2 wherein said hood is attached to said base for pivotal movement of said hood about an axis extending along the rear side of said base and said control and display module is mounted to be clear of pivotal movement of said hood.

4. An incubator according to claim 2 wherein said means for attaching said control and display module to said post include means for pivoting said control and display module about a vertical axis.

5. An incubator according to claim 3 wherein said means for attaching said control and display module to said post include means for pivoting said control and display module about a vertical axis.

6. An incubator according to claim 2 wherein said post is hollow and said means for transmitting and receiving said signals include wires extending from said base through said post to said control and display module.

7. An incubator according to claim 5 wherein said means for pivoting said control and display module include:

(a) a support arm attached to said post, and

(b) a bracket mounted on said support arm for pivotal movement relative to said support arm and to which said control and display module is attached.

8. An incubator according to claim 7 wherein said means for pivoting said control and display module further include means for locking said bracket at a selected pivotal position.

9. An incubator according to claim 8 wherein said means for locking said bracket include:

(a) a series of openings in said support arm,

(b) a release latch mounted for movement toward and away from said series of openings and having a pin movable into and out from said openings, and

(c) means for urging said release latch toward said series of openings.

10. An incubator according to claim 9 wherein said support arm and said bracket have vertically aligned openings and said means for pivoting said controls and display module further include a sleeve extending through said vertically aligned openings.

11. An incubator according to claim 10 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base through said post and said sleeve to said controls and display module.

AMENDED CLAIMS

[received by the International Bureau on 9 July 1990 (09.07.90); original claims 1-11 replaced by amended claims 1-21 (10 pages)]

1. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control and display means for: (1) for controlling the environment within said hood, and (2) displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said control and display means to said base means and for positioning said control and display means in proximity to said hood at generally the eye-level of a standing adult such that said control and display means do not block the view, through said hood, of the adult while attending to the infant;

and means for transmitting signals to said control and display means and for receiving signals from said control and display means to effect the control of the environment within said hood and the display of the conditions of the environment within said hood and of the infant positioned within said hood.

2. Apparatus according to claim 1 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said control and display means to said post.

3. Apparatus according to claim 2 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said control and display means to be clear of the pivotal movement of said hood.

4. Apparatus according to claim 2 wherein said means for attaching said control and display means to said post include means for pivotally mounting said control and display means to said post to effect pivotal movement of said control and display means about a vertical axis that is parallel to the longest dimension of said post.

5. Apparatus according to claim 3 wherein said means for attaching said control and display means to said post include means for pivotally mounting said control and display means to said post to effect pivotal movement of said control and display means about a vertical axis that is parallel to the longest dimension of said post.

6. Apparatus according to claim 2 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base means through said post to said control and display means.

7. Apparatus according to claim 5 wherein said means for pivotally mounting said control and display module to said post include:

(a) a support arm attached to said post, and

(b) a bracket pivotally mounted on said support arm and attached to said control and display means.

8. Apparatus according to claim 7 wherein said means for pivotally mounting said control and display module further include means for locking said bracket at a selected pivotal position.

9. Apparatus according to claim 8 wherein said means for locking said bracket include:

(a) a series of openings in said support arm,

(b) a release latch adapted to be moved toward and away from said series of openings in concert with the pivotal movement of said bracket relative to said support arm and having a pin movable into and out from said openings, and

(c) means for urging said release latch toward said series of openings.

10. Apparatus according to claim 9 wherein said support arm and said bracket have openings which are aligned vertically with respect to the top surface of said base means and said means for pivotally mounting said control and display means further include a sleeve extending through said vertically aligned openings.

11. Apparatus according to claim 10 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base means through said post and said sleeve to said control and display means.

12. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control means for controlling the environment within said hood in response to the respective first and second signals;

display means for displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said display means to said base means and for positioning said display means in proximity to said hood at generally the eye-level of a standing adult such that said display means do not block the view, through said hood, of the adult while attending to the infant;

and means for: (1) transmitting signals to said display means to effect the display of the conditions of the environment within said hood and of the infant positioned within said hood, and (2) transmitting signals to said control means and receiving signals from said control means to effect the control of the environment within said hood.

13. Apparatus according to claim 12 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said display means to said post.

14. Apparatus according to claim 13 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said display means to be clear of the pivotal movement of said hood.

15. Apparatus according to claim 13 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of display means about a vertical axis that is parallel to the longest dimension of said post.

16. Apparatus according to claim 14 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of said display means about a vertical axis that is parallel to the longest dimension of said post.

17. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops

conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control means for controlling the environment within said hood in response to the respective first and second signals;

display means for displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said control means to said base means and for positioning said control means in proximity to said hood at generally the eye-level of a standing adult such that said control means do not block the view, through said hood, of the adult while attending to the infant;

and means for: (1) transmitting signals to said display means to effect the display of the conditions of the environment within said hood and of the infant positioned within said hood, and (2) transmitting signals

to said post to effect pivotal movement of control means about a vertical axis that is parallel to the longest dimension of said post.

21. Apparatus according to claim 19 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of said display means about a vertical axis that is parallel to the longest dimension of said post.

to said control means and receiving signals from said control means to effect the control of the environment within said hood.

18. Apparatus according to claim 17 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said control means to said post.

19. Apparatus according to claim 18 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said control means to be clear of the pivotal movement of said hood.

20. Apparatus according to claim 18 wherein said means for attaching said control means to said post include means for pivotally mounting said control means

STATEMENT UNI

Original claims 1 through 11, inclusive, on original pages 10 through 14, inclusive, have been amended to conform to claims which will be presented shortly in the corresponding United States Patent Application and the amended versions of claims 1 through 11, inclusive, are set forth on pages 10 through 19, inclusive, of the replacement sheets.

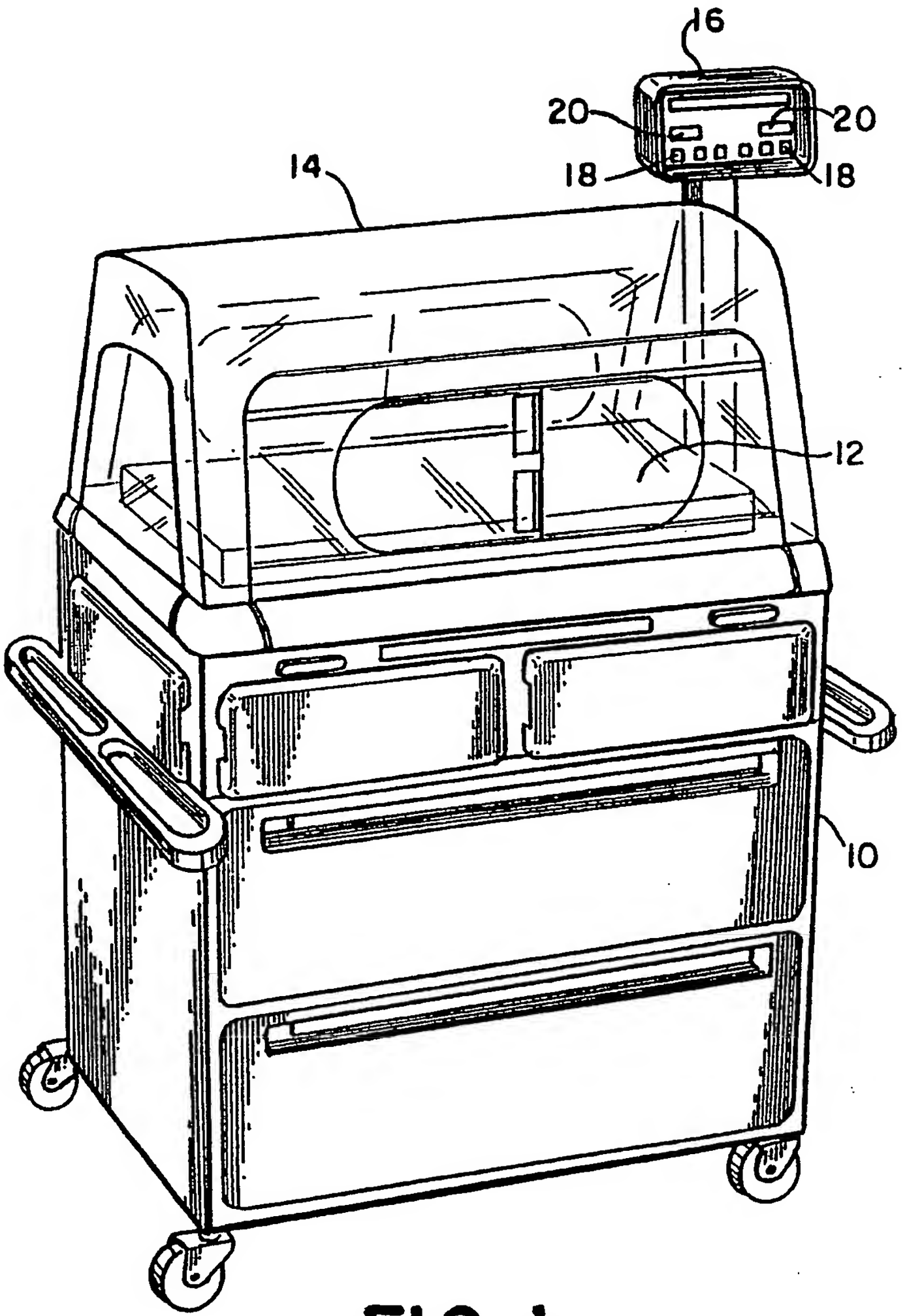
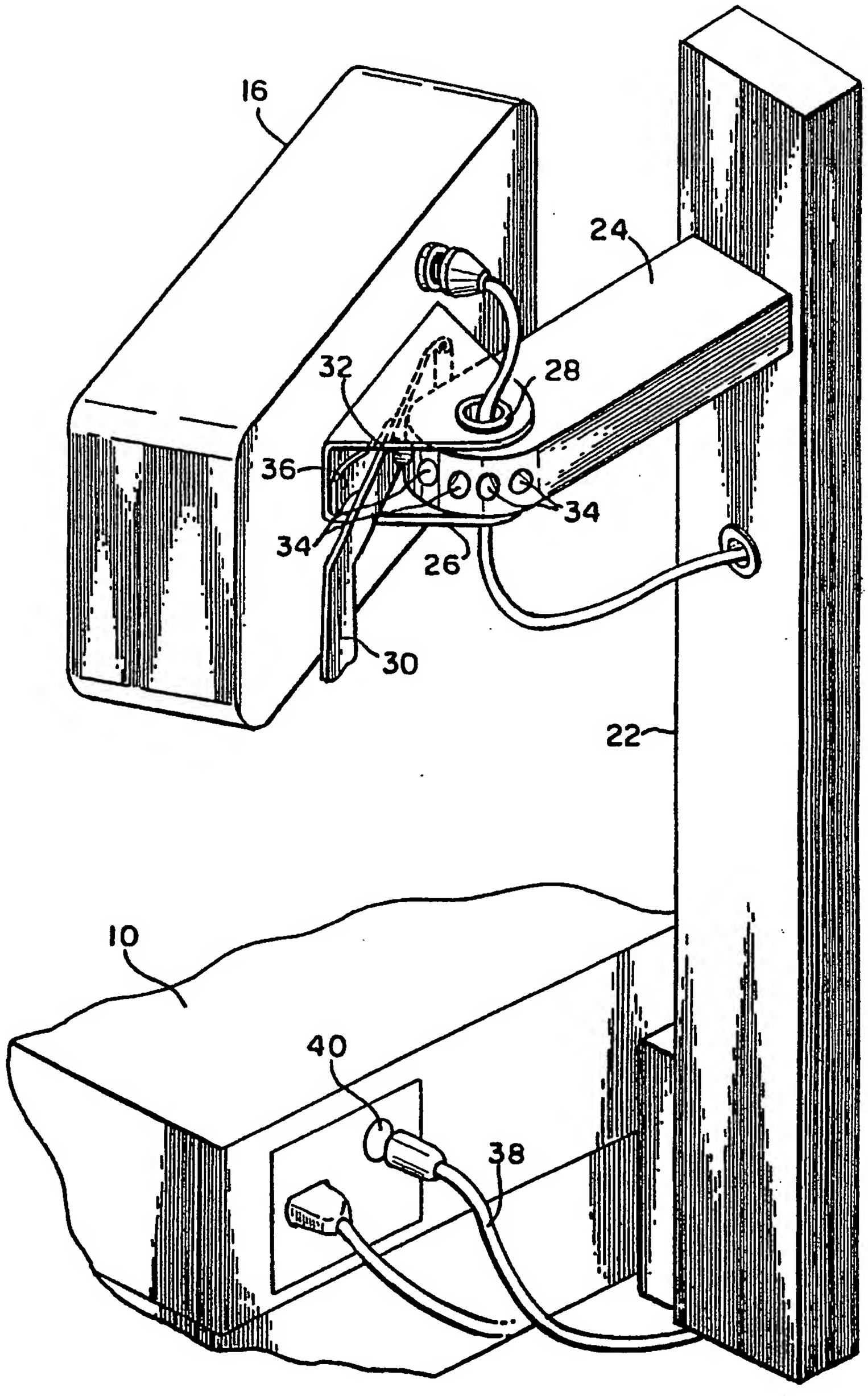


FIG. 1

FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/US 90/00872

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 G 11/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 61 G; G 12 B; G 06 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
Y	US, A, 3920000 (ATHERTON ET AL) 18 November 1975, see column 4, line 45 - line 47; column 5, line 2 - line 4; column 5, line 50 - line 57; column 8, line 21 - line 23 --	1-7
Y	DE, C2, 3014478 (SIEMENS AG) 22 October 1981, see claims 1,2 --	1-7
A	US, A, 3338233 (J. R. GROSHOLZ ET AL) 29 August 1967, see column 1, line 26 - line 29 --	1

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
16th May 1990	- 5. 06. 90
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	F.W. HECK

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTIN'JED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4617912 (BEER ET AL) 21 October 1986, see figure 2 --	1
A	US, A, 4681090 (KOCH) 21 July 1987, see column 1, line 64 - column 2, line 49 --	1
A	US, A, 4788965 (MILANI ET AL) 6 December 1988, see the whole document --	1
A	US, A, 3858570 (BELD ET AL) 7 January 1975, see the whole document --	1
P,A	Rein Elektronik"Flachmonitor am Schwenkarm", 1989, MC,, see page 15; figure 1 --	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/US 90/00872

SA 34771

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 07/05/90
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3920000	18/11/75	US-A- 4034740	12/07/77
DE-C2- 3014478	22/10/81	CA-A- 1160723	17/01/84
		EP-A-B- 0038068	21/10/81
		JP-A- 57027774	15/02/82
		US-A- 4437638	20/03/84
US-A- 3338233	29/08/67	NONE	
US-A- 4617912	21/10/86	CH-A-B- 664892	15/04/88
		DE-A- 3561632	31/03/88
		DE-U- 8514079	04/07/85
		EP-A-B- 0162375	27/11/85
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		FR-A-B- 2576783	08/08/86
		JP-A- 61181462	14/08/86
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		EP-A- 0237941	23/09/87
US-A- 3858570	07/01/75	NONE	

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(74) Agent: NEY, Andrew, L.; Ratner & Prestia, 500 North Gulph Road, P.O. Box 980, Valley Forge, PA 19482 (US).

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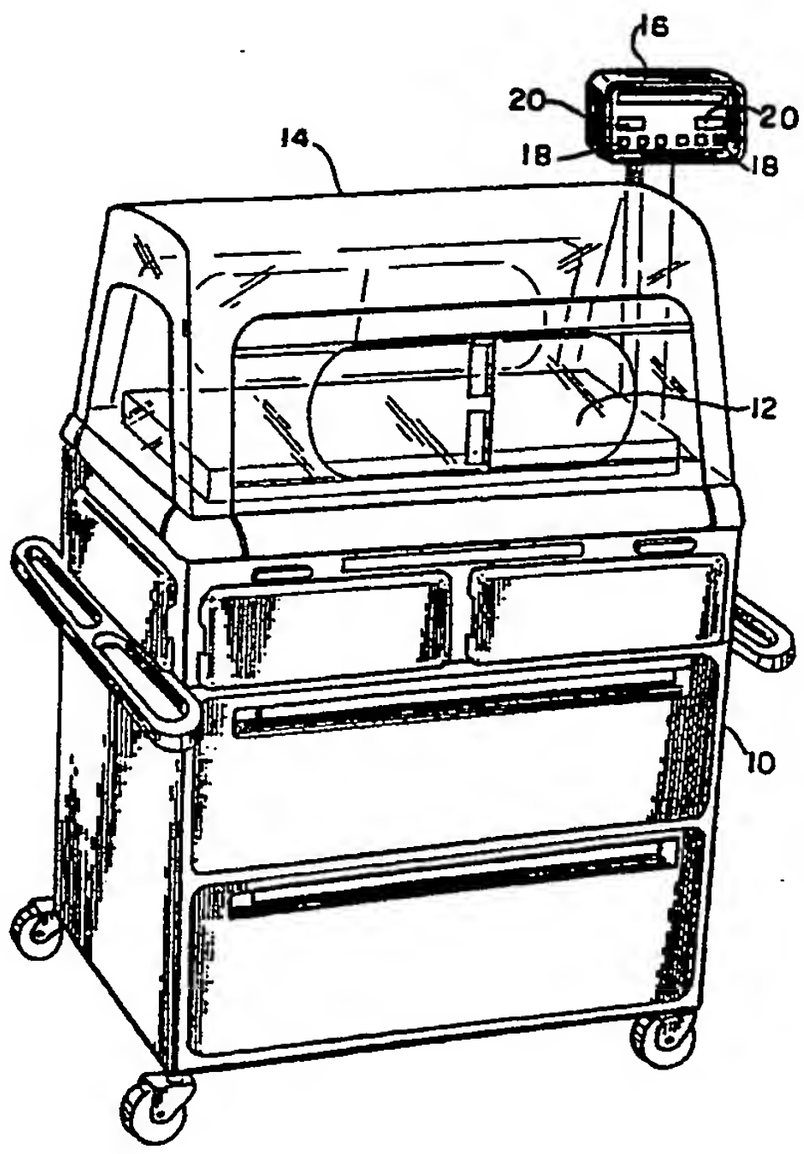

(57) Abstract

An infant incubator in which the controls and displays are provided in a module which is in proximity to but spaced from and above the hood of the incubator at generally the eye-level of a standing adult.

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INCUBATOR WITH REMOTE CONTROL AND DISPLAY MODULE

Technical Field

The present invention relates, in general, to infant incubators and, in particular, to an infant incubator having a control and display module positioned for easier access and better viewing than provided by currently known incubators.

Background Art

An incubator is a medical unit which provides a controlled environment for a premature or otherwise

delicate or sick infant. The incubator isolates the infant from the outside atmosphere which might be the source of infections or which might be inadequate to aid the infant in overcoming his difficulty.

Infant incubators generally are provided with control means for adjusting the environment within the incubator (i.e., the temperature, humidity, and oxygen content of the atmosphere within the incubator) and display means for indicating the conditions of the environment within the incubator and the condition of an infant positioned within the incubator (i.e., respiration rate and skin temperature). All known incubators have the controls and displays mounted on the front of the base of the incubator and below the hood. This location of the controls and displays is inconvenient to those attending to the care of an infant within the incubator. One must bend down to read the displays and, when the front door of the incubator is open to provide complete access to an infant, one must work around the open front door. In addition, in order to observe the displays which indicate the conditions within the incubator and the condition of the infant, one must be right at the incubator and cannot observe these displays from a remote location.

Disclosure of Invention

An incubator, constructed in accordance with the present invention, includes a base having an infant support and a hood mounted on the base and adapted to enclose the infant support. Also included are air conditioning means for developing conditioned air within the base and below the infant support and for circulating the conditioned air from below the infant support into the hood and returning air from the hood to below the infant support. This incubator further includes first sensing means for developing signals representative of the conditions of the environment within the hood and second sensing means for developing signals representative of the condition of an infant positioned within the hood. A control and display module is provided for (1) controlling the environment within the hood and (2) displaying the conditions of the environment within the hood and the condition of an infant within the hood. The control and display module is mounted at a position in proximity to but spaced from and above the hood at generally the eye-level of a standing adult. Also included are means for transmitting and receiving signals between the control and display module and: (1) the air conditioning means to control the environment within the hood, and (2) the first and the second sensing means to display the conditions of the environment within the hood and the condition of an infant positioned within the hood.

Brief Description of the Drawing

Referring to the drawing:

Figure 1 is a front, perspective view of an infant incubator constructed in accordance with the present invention; and

Figure 2 is a rear perspective view showing the manner in which the control and display module of the incubator is mounted on the base of the incubator.

Best Mode of Carrying Out the Invention

U.S. Patent No. 3,335,713 is incorporated herein by reference to supplement the disclosure of various components of an incubator, the details of which do not form a part of the present invention.

Referring to the drawing, an incubator, constructed in accordance with the present invention, includes a base 10 having an infant support 12 and a hood 14 mounted on base 10 and adapted to enclose infant support 12. Also included in the incubator are air conditioning means for developing conditioned air within base 10 and below infant support 12 and for circulating the conditioned air from below the infant

support into hood 14 and returning air from the hood to below the infant support. For additional details on an infant support which can be used and the apparatus for developing and circulating conditioned air, reference is made to U.S. Patent No. 3,335,713.

An incubator, constructed in accordance with the present invention, also includes first sensing means for developing signals representative of the conditions of the environment within hood 14 and second sensing means for developing signals representative of the condition of an infant positioned within the hood. The first sensing means can include, for example, a thermometer positioned at an appropriate location within hood 14 for developing a signal representative of the temperature within the hood. The second sensing means can include, for example, a skin temperature probe attached to the infant for developing a signal representative of the temperature of the infant. For additional details on the various sensors which can be used to monitor the incubator conditions and the condition of the infant, reference is made to U.S. Patent No. 3,335,713.

An incubator, constructed in accordance with the present invention, further includes a control and display module 16 for controlling the environment with hood 14 and displaying the conditions of the environment within the hood and the condition of an infant

within the hood. Control and display module 16 has a plurality of controls 18 which can control, for example, the temperature, humidity, oxygen content and circulation rate of the conditioned air which is introduced into hood 14. Control and display module 16 also has a plurality of displays 20 which can display the various parameters of the hood environment and the physical condition of the infant. The circuitry for effecting the desired controls and developing the desired displays can be of conventional construction and operation.

Control and display module 16 is positioned in proximity to but spaced from and above hood 14 at generally the eye-level of a standing adult. The positioning of control and display module 16 is such that it is clear of movement of hood 14 as the hood is pivoted to an open position about an axis extending along the rear side of base 10.

As shown most clearly in Figure 2, control and display module 16 is mounted by means of a vertically disposed post 22 which is attached at its lower end to base 10 and has the control and display module attached to its upper end. In the preferred embodiment of the invention, control and display module 16 is mounted for pivotal movement about a vertical axis. As a result, the control and display module can be positioned to suit the needs of those attending the infant

in the incubator as they treat the infant or monitor the infant and the incubator conditions from a remote location.

Control and display module 16 is attached to post 22 by means of a support arm 24 which is attached to the post, a bracket 26 to which the control and display module is attached, and a sleeve 28 which extends through vertically aligned openings in the support arm and the bracket and defines the vertical axis about which the control and display module pivots.

A locking mechanism is provided to fix the position of control and display module 16. For the embodiment of the invention illustrated, this locking mechanism includes a release latch 30 attached to bracket 26 for pivotal movement toward and away from support arm 24. Release latch 30 carries a pin 32 which is movable into and out from a series of openings 34 in support arm 24 as the release latch is moved toward and away from the support arm. A leaf spring 36, attached to bracket 26 and bearing against release latch 30, urges the release latch toward support arm 24, so that pin 32, carried by the release latch, will enter one of the openings 34 and lock control and display module 16 in place. To move the control and display module, release latch 30 is moved away from support arm 24 against the action of leaf spring 36 to retract pin 32 from opening 34. While pin 32 is clear

of any opening 34, control and display module 16 can be moved to the desired position and when release latch 30 is released, pin 32 can enter an opening 34 at the new position of the control and display module.

Also included in an incubator, constructed in accordance with the present invention, are means for transmitting and receiving signals between control and display module 16 and the air conditioning means and the first and second sensing means. Such means include wires 38 which extend between a connector 40 in base 10 and control and display module 16. The sensors in hood 14 and on the infant and the air conditioning means are electrically connected to connector 40 in the usual manner. In this way, controls 18 on the control and display module control the operation of the air conditioning means to control the environment within hood 14 and displays 20 on the control and display module display the conditions of the environment within the hood and the condition of an infant positioned within the hood. For the embodiment of the invention illustrated, post 22 is hollow and wires 38 extend from base 10 through the post. Wires 38 exit post 22 and extend beneath support arm 24 and up through sleeve 28 to control and display module 16.

While in the foregoing there has been described a preferred embodiment of the invention, it should be understood to those skilled in the art that

various modifications and changes can be made without departing from the true spirit and scope of this invention.

IN THE CLAIMS:

1. An incubator comprising:

a base having an infant support;

a hood mounted on said base and adapted to enclose said infant support;

air conditioning means for developing conditioned air within said base and below said infant support and for circulating conditioned air from below said infant support into said hood and returning air from said hood to below said infant support;

first sensing means for developing signals representative of the conditions of the environment within said hood;

second sensing means for developing signals representative of the condition of an infant positioned within said hood;

a control and display module for:

(1) controlling the environment within said hood, and

(2) displaying the conditions of the environment within said hood and the condition of an infant positioned within said hood;

mounting means for positioning said control and display module in proximity to but spaced from and above said hood at generally the eye-level of a standing adult;

and means for transmitting and receiving signals between said control and display module and: (1) said air conditioning means to control the environment within said hood, and (2) said first and said second sensing means to display the conditions of the environment within said hood and the condition of an infant positioned within said hood.

2. An incubator according to claim 1 wherein said mounting means include:

(a) a vertically disposed post,

(b) means for attaching the lower end of said post to said base, and

(c) means at the upper end of said post for attaching said control and display module to said post.

3. An incubator according to claim 2 wherein said hood is attached to said base for pivotal movement of said hood about an axis extending along the rear side of said base and said control and display module is mounted to be clear of pivotal movement of said hood.

4. An incubator according to claim 2 wherein said means for attaching said control and display module to said post include means for pivoting said control and display module about a vertical axis.

5. An incubator according to claim 3 wherein said means for attaching said control and display module to said post include means for pivoting said control and display module about a vertical axis.

6. An incubator according to claim 2 wherein said post is hollow and said means for transmitting and receiving said signals include wires extending from said base through said post to said control and display module.

7. An incubator according to claim 5 wherein said means for pivoting said control and display module include:

(a) a support arm attached to said post, and

(b) a bracket mounted on said support arm for pivotal movement relative to said support arm and to which said control and display module is attached.

8. An incubator according to claim 7 wherein said means for pivoting said control and display module further include means for locking said bracket at a selected pivotal position.

9. An incubator according to claim 8 wherein said means for locking said bracket include:

(a) a series of openings in said support arm,

(b) a release latch mounted for movement toward and away from said series of openings and having a pin movable into and out from said openings, and

(c) means for urging said release latch toward said series of openings.

10. An incubator according to claim 9 wherein said support arm and said bracket have vertically aligned openings and said means for pivoting said controls and display module further include a sleeve extending through said vertically aligned openings.

11. An incubator according to claim 10 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base through said post and said sleeve to said controls and display module.

AMENDED CLAIMS

[received by the International Bureau on 9 July 1990 (09.07.90); original claims 1-11 replaced by amended claims 1-21 (10 pages)]

1. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control and display means for: (1) for controlling the environment within said hood, and (2) displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said control and display means to said base means and for positioning said control and display means in proximity to said hood at generally the eye-level of a standing adult such that said control and display means do not block the view, through said hood, of the adult while attending to the infant;

and means for transmitting signals to said control and display means and for receiving signals from said control and display means to effect the control of the environment within said hood and the display of the conditions of the environment within said hood and of the infant positioned within said hood.

2. Apparatus according to claim 1 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said control and display means to said post.

3. Apparatus according to claim 2 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said control and display means to be clear of the pivotal movement of said hood.

4. Apparatus according to claim 2 wherein said means for attaching said control and display means to said post include means for pivotally mounting said control and display means to said post to effect pivotal movement of said control and display means about a vertical axis that is parallel to the longest dimension of said post.

5. Apparatus according to claim 3 wherein said means for attaching said control and display means to said post include means for pivotally mounting said control and display means to said post to effect pivotal movement of said control and display means about a vertical axis that is parallel to the longest dimension of said post.

6. Apparatus according to claim 2 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base means through said post to said control and display means.

7. Apparatus according to claim 5 wherein said means for pivotally mounting said control and display module to said post include:

(a) a support arm attached to said post, and

(b) a bracket pivotally mounted on said support arm and attached to said control and display means.

8. Apparatus according to claim 7 wherein said means for pivotally mounting said control and display module further include means for locking said bracket at a selected pivotal position.

9. Apparatus according to claim 8 wherein said means for locking said bracket include:

(a) a series of openings in said support arm,

(b) a release latch adapted to be moved toward and away from said series of openings in concert with the pivotal movement of said bracket relative to said support arm and having a pin movable into and out from said openings, and

(c) means for urging said release latch toward said series of openings.

10. Apparatus according to claim 9 wherein said support arm and said bracket have openings which are aligned vertically with respect to the top surface of said base means and said means for pivotally mounting said control and display means further include a sleeve extending through said vertically aligned openings.

11. Apparatus according to claim 10 wherein said post is hollow and said means for transmitting and receiving signals include wires extending from said base means through said post and said sleeve to said control and display means.

12. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control means for controlling the environment within said hood in response to the respective first and second signals;

display means for displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said display means to said base means and for positioning said display means in proximity to said hood at generally the eye-level of a standing adult such that said display means do not block the view, through said hood, of the adult while attending to the infant;

and means for: (1) transmitting signals to said display means to effect the display of the conditions of the environment within said hood and of the infant positioned within said hood, and (2) transmitting signals to said control means and receiving signals from said control means to effect the control of the environment within said hood.

13. Apparatus according to claim 12 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said display means to said post.

14. Apparatus according to claim 13 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said display means to be clear of the pivotal movement of said hood.

15. Apparatus according to claim 13 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of display means about a vertical axis that is parallel to the longest dimension of said post.

16. Apparatus according to claim 14 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of said display means about a vertical axis that is parallel to the longest dimension of said post.

17. In an incubator including infant support means for an infant, a transparent hood adapted to enclose the infant support means in a protective environment, an air conditioner which develops

conditioned air for circulation to provide a controlled environment in the hood, first and second sensor means for developing first and second signals respectively representative of conditions of the environment within the hood and of an infant positioned within the hood, apparatus comprising:

base means for holding the air conditioner and having a top surface upon which said infant support means are positioned and upon which said hood is mounted;

control means for controlling the environment within said hood in response to the respective first and second signals;

display means for displaying the conditions of the environment within said hood and of an infant positioned within said hood in response to the respective first and second signals;

mounting means for attaching said control means to said base means and for positioning said control means in proximity to said hood at generally the eye-level of a standing adult such that said control means do not block the view, through said hood, of the adult while attending to the infant;

and means for: (1) transmitting signals to said display means to effect the display of the conditions of the environment within said hood and of the infant positioned within said hood, and (2) transmitting signals

to said post to effect pivotal movement of control means about a vertical axis that is parallel to the longest dimension of said post.

21. Apparatus according to claim 19 wherein said means for attaching said display means to said post include means for pivotally mounting said display means to said post to effect pivotal movement of said display means about a vertical axis that is parallel to the longest dimension of said post.

to said control means and receiving signals from said control means to effect the control of the environment within said hood.

18. Apparatus according to claim 17 wherein said mounting means include:

(a) a post, vertically disposed with respect to said top surface of said base means, having an upper end and a lower end,

(b) means for attaching said lower end of said post to said base means, and

(c) means at said upper end of said post for attaching said control means to said post.

19. Apparatus according to claim 18 wherein:

(a) said base means include a rear side and means, coupled to said rear side, for attaching said hood to said base means for pivotal movement of said hood about an axis in the plane containing said rear side, and

(b) said mounting means permit positioning of said control means to be clear of the pivotal movement of said hood.

20. Apparatus according to claim 18 wherein said means for attaching said control means to said post include means for pivotally mounting said control means

STATEMENT UNI

Original claims 1 through 11, inclusive, on original pages 10 through 14, inclusive, have been amended to conform to claims which will be presented shortly in the corresponding United States Patent Application and the amended versions of claims 1 through 11, inclusive, are set forth on pages 10 through 19, inclusive, of the replacement sheets.

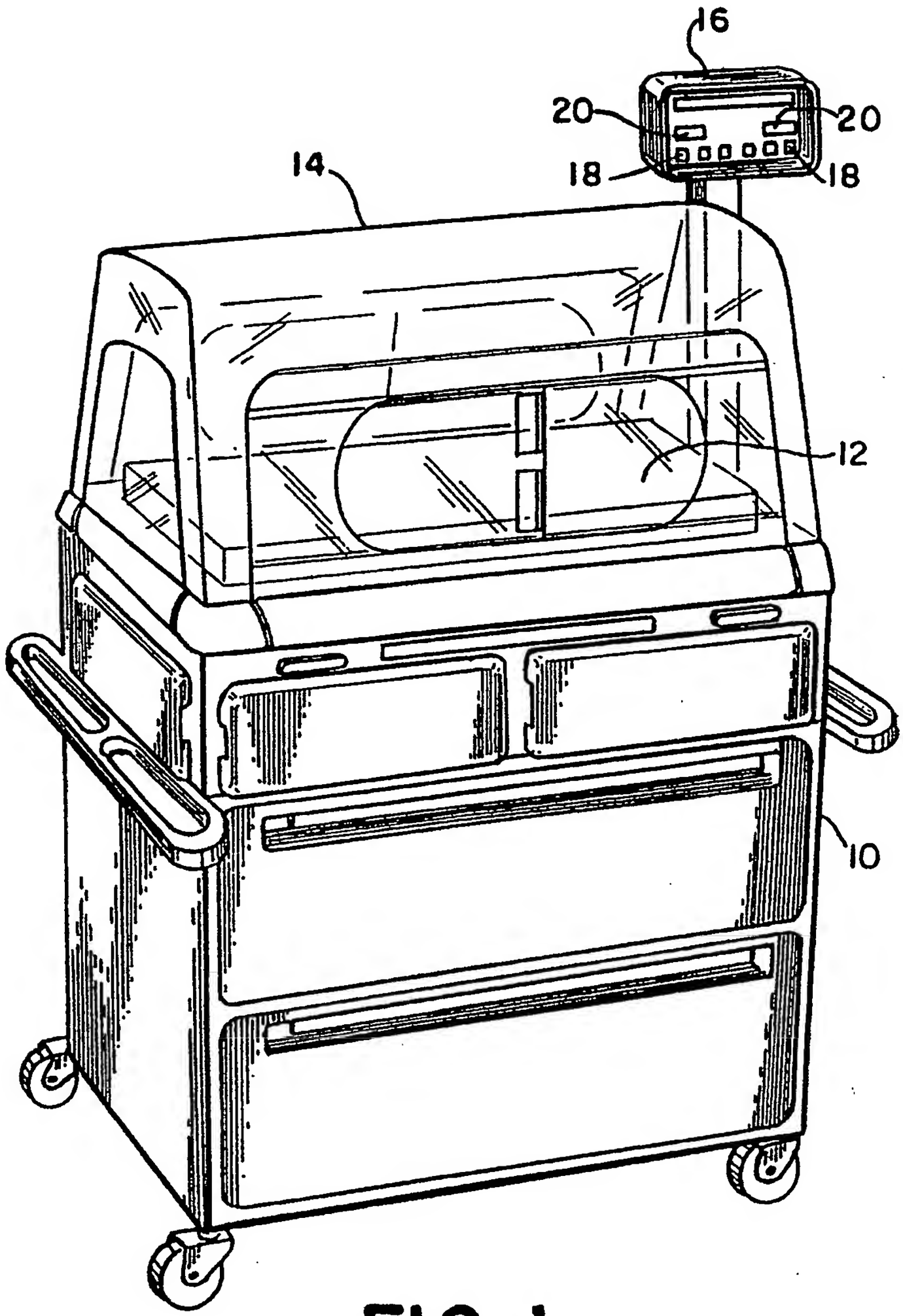
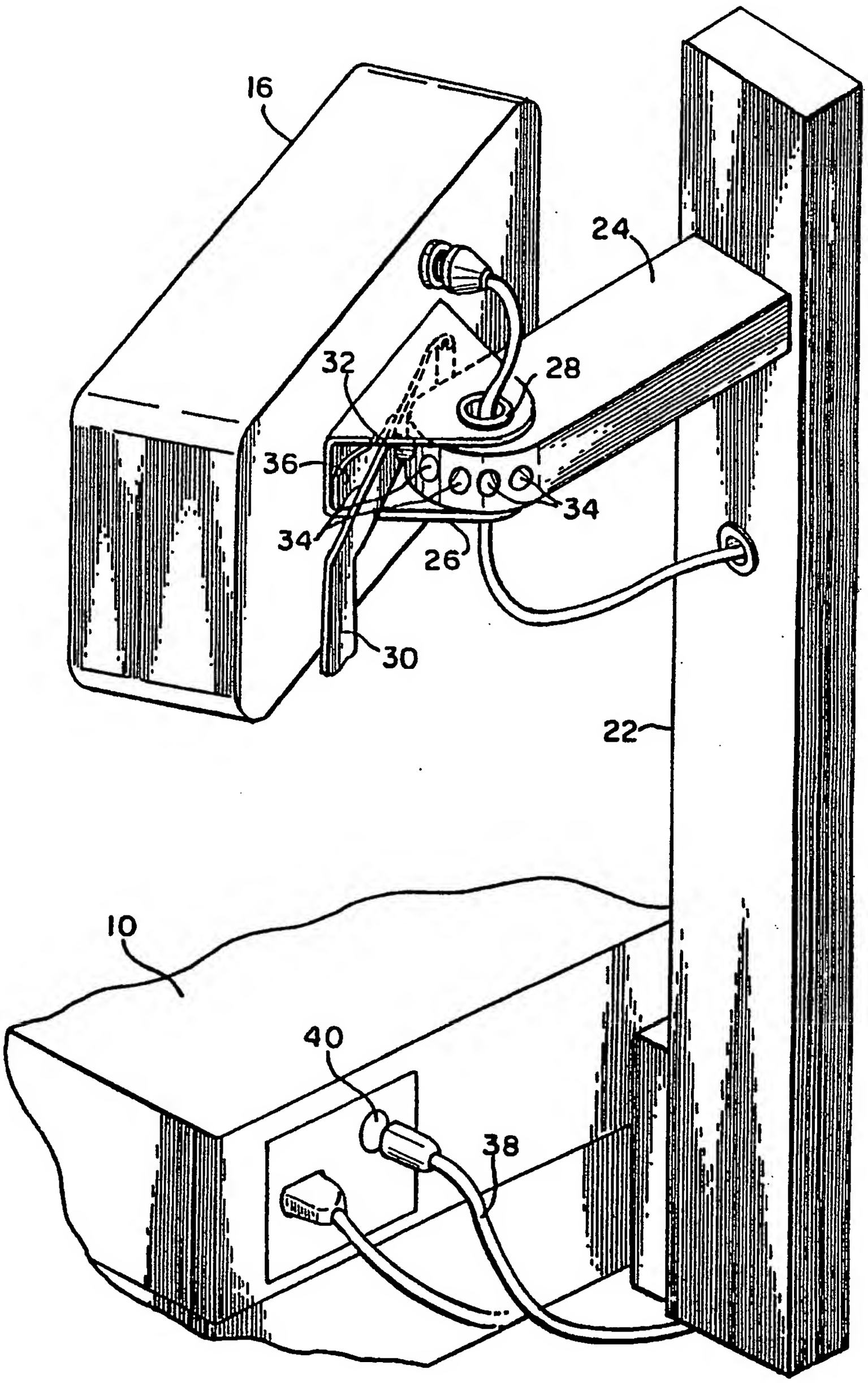


FIG. 1

FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/US 90/00872

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 G 11/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	A 61 G; G 12 B; G 06 F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
Y	US, A, 3920000 (ATHERTON ET AL) 18 November 1975, see column 4, line 45 - line 47; column 5, line 2 - line 4; column 5, line 50 - line 57; column 8, line 21 - line 23 --	1-7
Y	DE, C2, 3014478 (SIEMENS AG) 22 October 1981, see claims 1,2 --	1-7
A	US, A, 3338233 (J. R. GROSHOLZ ET AL) 29 August 1967, see column 1, line 26 - line 29 --	1

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
16th May 1990	- 5. 06. 90
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	F.W. HECK

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTIN'JED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4617912 (BEER ET AL) 21 October 1986, see figure 2 --	1
A	US, A, 4681090 (KOCH) 21 July 1987, see column 1, line 64 - column 2, line 49 --	1
A	US, A, 4788965 (MILANI ET AL) 6 December 1988, see the whole document --	1
A	US, A, 3858570 (BELD ET AL) 7 January 1975, see the whole document --	1
P,A	Rein Elektronik"Flachmonitor am Schwenkarm", 1989, MC,, see page 15; figure 1 --	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/US 90/00872

SA 34771

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 07/05/90
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3920000	18/11/75	US-A- 4034740	12/07/77
DE-C2- 3014478	22/10/81	CA-A- 1160723	17/01/84
		EP-A-B- 0038068	21/10/81
		JP-A- 57027774	15/02/82
		US-A- 4437638	20/03/84
US-A- 3338233	29/08/67	NONE	
US-A- 4617912	21/10/86	CH-A-B- 664892	15/04/88
		DE-A- 3561632	31/03/88
		DE-U- 8514079	04/07/85
		EP-A-B- 0162375	27/11/85
		JP-A- 61011046	18/01/86
US-A- 4681090	21/07/87	DE-A- 3503418	07/08/86
		FR-A-B- 2576783	08/08/86
		JP-A- 61181462	14/08/86
US-A- 4788965	06/12/88	DE-C- 3609147	23/04/87
		EP-A- 0237941	23/09/87
US-A- 3858570	07/01/75	NONE	